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THIS ISSUE

Guidelines for Electrodiagnostic Evaluation of Carpal Tunnel Sydrome

Addendum-November 1995

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The following is an addendum to the guidelines for diagnosis and treatment of Occupational Carpal Tunnel Syndrome (OCTS) previously published in the September, 1993 *Provider Bulletin.* It contains three items.

Section 1 - A reprint of the September 1993 guidelines on carpal tunnel syndrome with minor modifications

Section 2 - A comment on the role of needle electromyography in the electrodiagnostic evaluation of carpal tunnel syndrome.

Section 3 - A description of the Work Sheet that electromyographers should use when evaluating a patient for carpal tunnel syndrome.

In the event that you need extra copies of this *Provider Bulletin*, please contact Labor and Industries at (360) 902-6799.

These guidelines were developed by the Washington State Department of Labor and Industries in collaboration with the Washington State Medical Association (WSMA) Medical Treatment Guideline Subcommittee.

SECTION 1

GUIDELINES FOR TIIE DIAGNOSIS AND TREATMENT OF OCCUPATIONAL CARPAL TUNNEL SYNDROME (OCTS)

These guidelines are to be used by physicians and Labor and Industry claim managers.

I. CLAIM ACCEPTANCE

In general, both appropriate symptoms and signs and work relatedness should be present for Labor and Industries to accept a claim as OCTS. Nerve conduction velocity testing (NCVs) is not necessary for claim acceptance except in questionable circumstances.

A. Symptoms and Signs

Appropriate symptoms would include, numbness, tingling or burning pain of one or both hands, especially noted after work and at night. These nocturnal symptoms are prominent in 50-70% of patients. Patients frequently awaken at night or early morning and shake their hands to rid themselves of these symptoms. The location of these symptoms may be in the entire hand or localized to the thumb and first two or three fingers. If the nerve symptoms are prominent only in the fourth and fifth fingers (ring and little fingers), a different diagnosis (e.g., ulnar neuropathy) should be considered. Although burning pain is often prominent in the hands and palm side of the wrists, an aching pain may radiate (be felt in) to the medial elbow region or more proximally to the shoulder.

Findings on physical examination (signs) are frequently absent or non-specific. Tinel's sign (tapping on the wrist or over the median nerve) and Phelan's signs (forced flexion of the wrist) are frequently described, but by themselves are not specifically diagnostic of OCTS. Their presence merely corroborates the presence of other clear neurologic symptoms.

Other signs are more specific and include decreased sensation to pin or light touch in the palm and first three digits or weakness or atrophy of the muscles of the thenar eminence (especially the adbuctor pollucis brevis). The presence of the latter signs (but not Tinel's orPhelan's) may suggest more acute or advanced nerve injury and perhaps the need for more aggressive treatment.

In general, symptoms are better when not working and on holidays when the worker has been removed from the workplace exposure. Non-specific symptoms, (e.g., pain without numbness, tingling or burning or "dropping things") should not be considered for the diagnosis of OCTS.

B. Work-relatedness

Any activity requiring extensive or continuous use of the hands in work may be an appropriate exposure. In general, one of the following work conditions should be occurring on a regular basis:

1) Repetitive hand use, especially for prolonged periods (e.g., keyboard users), against force (e.g., meat cutters) or with awkward hand positions (e.g., grocery checkers), with repeated wrist flexion, extension or deviation as well as forearm rotation, or with constant firm gripping.

2) The presence of regular, strong vibrations (e.g., jackhammer, chainsaw).

3) Regular or intermittent pressure on the wrist. (Note: acute carpal tunnel syndrome may be associated with acute trauma, i.e., fracture, crush injury of wrist, etc.).

The types of jobs that are most frequently mentioned in the literature or reported in L&I's data include: meat cutting; seafood, fruit, or meat processing or canning; carpentry; roofing; dry walling; boat building; book binding; wood products work; dental hygienist; and intensive word processing. This is not an exhaustive list. It is only meant to be a guide in consideration of work- relatedness. If the history of exposure is unclear, then speaking directly with the employer or claimant, or doing a walk through, to obtain more detailed information on job duties would be critical.

II. NERVE CONDUCTION TESTING (NCVs)

It is critical to obtain NCV testing in the following situations:

1. The attending physician's diagnosis is OCTS, but the clinical criteria (appropriate neurologic symptoms and/or signs) described above are not met.
2. The patient has been on time loss for OCTS for more than two weeks and the clinical criteria are met.
3. Carpal tunnel decompression surgery is requested.

Conceptually, validation of the clinical diagnosis of OCTS depends on the finding of sequential slowing of sensory and/or motor fibers of the median nerve across the carpal tunnel.

The most useful nerve conduction tests with their ***(upper limit of) normal cut-points*** are as follows:

Median motor distal latency	4.5 msec (slowing would be longer, i.e., greater than 4.5 msec)	
Median sensory distal latency	wrist-digit II (14 cm)	=3.5 msec
	palm-wrist (8 cm)	=2.2 msec
Median-ulnar sensory latency difference	finger-wrist difference (14 cm)	=0.5 msec
	palm-wrist difference (8 cm)	=0.3 msec

These upper limit cut points are derived from published literature. If the electromyographer performs non-conventional tests for OCTS not listed here, normal values should have been established in that physician's laboratory.

Labs can use their own cut points if they have adequately established their own normal values.

In all cases, and particularly in cases with borderline NCV results, control for skin temperature should be documented. In general, the above referenced values will hold for skin temperature in the

range of 30-34 degrees Centigrade. Lower temperatures will be associated with falsely slowed NCV results.

An electromyogram (EMG), or needle examination of the muscles supplied by the median nerve, maybe useful in documenting actual nerve damage (axonal loss). This test should be done especially in cases with sensory loss, weakness or muscle atrophy in the median nerve distribution.

III. TREATMENT

A. Conservative treatment

Conservative management may be helpful and may include:

1) Splinting of the wrist. (May be more useful at night).

2) Anti inflammatorv medication including non steroidals.

3) Steroid injections - although this form of treatment is favored by some physicians, it may not have long term benefits and may itself cause nerve injury. No more than ***two steroid injections over a three-month period*** will be authorized.

The duration of conservative treatment will primarily depend on whether the patient can remain at work. Most patients will improve when off work, whether or not specific treatment is rendered. In some cases, job modification, along with conservative treatment, may improve symptoms and prevent worsening of OCTS. If job modification is not possible, or if the claimant cannot continue working with conservative treatment, then surgery should be considered as a treatment option.

B. Surgery

Decompression of the transverse carpal ligament is the surgical procedure of choice for OCTS. A second procedure, internal neurolvsis, or freeing up ofthe nerve, is sometimes requested; however, there is no evidence to suggest that this procedure is necessarv and. in most cases. requests for this procedure will be denied. Questions about this procedure should be referred to the department's orthopedic consultant by calling (360) 902-5026.

In general, the following criteria should have been met for authorization of surgery to occur:

1) The clinical history should be consistent with OCTS.

2) NCVs should have demonstrated a conduction slowing of the median motor or sensory fibers across the carpal tunnel.

3) A course of conservative management must have been tried.

Most studies suggest that in 60-90% of the post-surgical cases the burning pain associated with OCTS will be alleviated. The patient's ability to return to the same job is not clear. If pain persists or recurs, NCVs can help sort out whether nerve entrapment continues to be a problem.

IV. SPECIAL CASES

Questions may arise in several specific situations that may raise questions about the validity of the claim for OCTS or about the need for surgery.

A. Work-relatedness may not be obvious. Some work exposures do not meet the guidelines for work-relatedness. If there is a question about the job exposure and whether such exposure could cause OCTS, the claim manager should refer the case to the occupational medical consultant by calling (360) 902-5026.

B. Surgery may be requested in those injured workers whose clinical picture and work relatedness is quite clear. but whose NCVs are normal. Most clinicians agree that a minority (<10%) of patients with clinical OCTS may have normal NCVs. Options here may be the following:

1) Were the most sensitive and specific NCV tests done (e.g., palm-wrist median sensory latency)? If not, request that they be done.

2) If the NCVs were done after a period of not working, previously abnormal NCVs may have returned to normal. It would be reasonable in these cases to suggest that the claimant return to work for a brief time (a few days to a week) and repeat NCVs while they are still working.

C. If OCTS is not documented by clinical criteria and NCV testing, other clinical problems related to repetitive use (i.e.. tendonitis) should be investigated and treated appropriately. It would also be important to rule out other neurologic causes of tingling in the hands. Referral to an appropriate specialist (neurologist, physiatrist) would be prudent in such cases.

D. Carpal tunnel syndrome may also be caused by anything that decreases the cross-sectional area of the carpal tunnel or adds to the volume of the carpal tunnel, resulting in increased pressure on the median nerve. This could occur by distortion of the bones or ligaments by fracture or crush injury of the forearm or hand associated with generalized or chronic swelling (edema).

E. Carpal tunnel syndrome may be associated with other chronic conditions that may cause nerve damage or predispose a nerve to injury from compression. The most common of these conditions is diabetes. The key test here is whether, in spite of the presence of such condition, the symptoms of OCTS can be documented to have begun only after beginning work at the job in question.

F. A predisposing, physiological condition is pregnancy, wherein increased plasma volume increases pressure within the carpal tunnel. In such cases, symptoms universally disappear immediately after birth. If they do not, other etiologies (e.g., work-related, diabetes) should be pursued.

V. RETURN TO WORK AFTER OCTS SURGERY

The vast majority of persons with work-related OCTS are expected to have dramatic relief of their symptoms after carpal tunnel decompression surgery and should return to their same job. Return to work, with or without job modification, should be tried in most people. If symptoms worsen or reappear after return to work, repeat NCVs will help to sort out if OCTS has recurred, and if surgery successfully removed the pressure on the median nerve (NCVs will improve with successful surgery, although they may not return completely to normal).

CRITERIA #11 - CARPAL TUNNEL

PROCEDURE	CONSERVATIVE CARE	CLINICAL FINDINGS		
		SUBJECTIVE	OBJECTIVE	DIAGNOSTIC
DECOMPRESSION OF THE MEDIAN NERVE	• Splinting AND • Anti-inflammatory medication • Steroid injections * * No more than 2 injections in 3 months NOTE: in the absence of conservative care or with minimal conservative care, a request for surgery can still be considered pending clinical findings.	• Complaints of numbness, tingling, or "burning" pain of the hand or thumb and first 2 fingers. OR Nocturnal symptoms may be prominent NOTE: Pain may radiate to inner elbow or to the shoulder	• Decreased sensation to pin in palm and first 3 digits OR • Weakness or atrophy of the thenar eminence muscles.	AND • Abnormal nerve conduction studies Any one abnormality in one of the following *: • Median motor distal latency >4.5 • Median sensory distal latency wrist digit II (14 cm) >3.5 msec palm-wrist (8 cm) > 2.2 msec • Median-ulnar sensory latency finger-wrist difference >0.5 msec palm-wrist difference >0.3 msec **OR** • Positive Needle EMG in cases of definite sensory deficit in median nerve distribution or weakness/ atrophy of the thenar muscle NOTE: If test result borderline, may want to repeat after (attempts to) RTW. * NCV must be done with control for skin temperature. Values are true for temperature in range of 30-34 C.
	Nerve Conduction studies should be done if worker is off work for > than two weeks or surgery requested			

SECTION 2

NEEDLE ELECTROMYOGRAPHY IN THE DIAGNOSIS OF CARPAL TUNNEL SYNDROME

Needle electromography has only a limited role in the electrodiagnostic evaluation of carpal tunnel syndrome. It should generally not be done if nerve conduction studies are normal. There are three circumstances in which it would be reasonable to do needle electromography during an evaluation for carpal tunnel syndrome:

a. Nerve conduction studies are abnormal in a manner indicating carpal tunnel syndrome, and the patient demonstrates wasting or clinical weakness of the thenar muscles.

b. The electromyographer suspects that a neuropathic process other than (or in addition to) carpal tunnel syndrome exists (e.g., diabetes).

c. There is a history of an acute crush injury or other major trauma to the distal upper extremity.

SECTION 3

WORKSHEET FOR CARPAL TUNNEL SYNDROME ELECTRODIAGNOSTIC STUDIES

DOCTORS PLEASE NOTE: This worksheet should accompany, BUT NOT REPLACE, the detailed report normally submitted to the department.

1. The purpose of this work sheet is to help medical consultants at L&I interpret electrodiagnostic testing that you do on L&I patients. It is for this reason that the worksheet follows on distal latency. The work sheet should be used only when the main purpose of your study is to evaluate a patient for OCTS.

2. You may have an automated system for reporting electrodiagnostic results. Feel free to send this in. But the department's worksheet should also be filled out and submitted.

3. On the worksheet, sensory distal latency should be measured to response peak and motor distal latency should be measured to response onset.

4. It is not necessary to do all the conduction studies listed on the work sheet. You should do only the studies needed to rule OCTS in or out.

5. It is sometimes necessary to do electrodiagnostic tests other than ones listed on the work sheet. If you do any additional studies bearing on the diagnosis of OCTS, please write them in the blank area below the listed studies.

6. If the inching technique of Kimura is used, only a maximum latency difference between 1 cm segments of 0.5 msec will be accepted as specific enough to corroborate the presence of OCTS.

7. The value of other studies of median nerve function has not been proven. These tests are NOT recommended for the diagnosis of OCTS. The following quotation is taken from a literature review published in Muscle & Nerve, 1993, Vol. 16, p. 1392-1414:

> "Several other variations on median sensory and motor NCS's have been reported to be useful for the evaluation of patient's with OCTS. The committee's review of the literature indicated that the value of these tests for the clinical electrodiagnostic evaluation of patients with OCTS remains to be established. These electrodiagnastic studies include the following: (1) studies of the median motor distal latency recorded from the lumbrical muscles,.. (2) measurement ofthe refractory period of the median nerve,... (3) median motor residual latency measurements,... (4) terminal latency ratio,... (5) median F-wave abnormalities,... (6) median motor nerve conduction amplitude comparisons with stimulation above and below the carpal ligament,... (7) anterior interosseous/median nerve latency ratio,.(8) change in median motor response configuration with median nerve stimulation at the wrist and elbow in the presence of Martin-Gruber anastomosis,... (9) sensory amplitude measurements,... and (10) measurement of median sensory and motor nerve conduction across the wrist before and after prolonged wrist flexion."

The Washington State Medical Association (WSMA) Medical Treatment Guideline Subcommittee and the Department of Labor and Industries Office of the Medical Director endorses the opinions in the above quote and believes that electromyographers should act in accordance with these opinions.

WORK SHEET FOR CARPAL TUNNEL NERVE CONDUCTION STUDIES

	Abnormal cut-point	Right Arm Distal Latency (msec)	Left Arm Distal Latency (msec)
1. Median motor to APB	>4.5 msec		
2. Median sensory over 14 cm (wrist to digit 2 or 3)	>3.5 msec		
3. Median sensory over 8 cm (transcarpal)	>2.2 msec		
4. Median sensory to Digit 4 MINUS Uluar sensorv to Digit 4	>.5 msec		
5. Median sensory (transcarpal) MINUS Ulnar sensory (transcarpal)	>.3 msec		
6. Ulnar sensory to Digit 5	>3.6 msec		

Claim Number: _____
Claimant Name: _____

Additional Comments:
_____
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_____ ____/____/____
Signed Date

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